

CLAIMS

1. A fluoropolymer liquid composition comprising a fluoropolymer liquid (A) which comprises a liquid medium
5 and a crosslinkable functional group-containing crosslinkable fluoropolymer,

wherein said fluoropolymer liquid (A) is a fluoropolymer liquid dispersion (AD) having, dispersed in a liquid dispersion medium, particles of a crosslinkable
10 fluoropolymer (PD) containing acid/acid salt groups or organic groups capable of undergoing hydrolysis and thus being converted to carboxyl groups, or a fluoropolymer solution (AS) having, dissolved in a fluorosolvent or an alcohol/water mixed solvent, a crosslinkable fluoropolymer
15 (PS) containing acid/acid salt groups or acid/acid salt groups precursors;

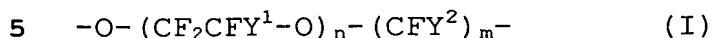
said acid/acid salt groups are sulfonic acid groups, carboxyl groups or groups of the formula $-\text{SO}_2\text{NR}^2\text{R}^3$, $-\text{SO}_3\text{NR}^4\text{R}^5\text{R}^6\text{R}^7$, $-\text{SO}_3\text{M}^1_{1/L}$, $-\text{COONR}^8\text{R}^9\text{R}^{10}\text{R}^{11}$ or $-\text{COOM}^2_{1/L}$, wherein R^2
20 represents a hydrogen atom or $\text{M}^5_{1/L}$, R^3 represents an alkyl group or an sulfonyl-containing group, R^4 , R^5 , R^6 , R^7 , R^8 , R^9 , R^{10} and R^{11} are the same or different and each represents a hydrogen atom or an alkyl group, and M^1 , M^2 and M^5 each
25 represents a metal having a valence of L, said metal having a valence of L being a metal belonging to the group 1, 2, 4, 8, 11, 12 or 13 of the periodic table; and

said acid/acid salt groups precursors are $-\text{SO}_2\text{F}$, $-\text{SO}_2\text{NR}^{22}\text{R}^{23}$ (wherein R^{22} and R^{23} are the same or different and each represents an alkyl group) or organic groups capable
30 of undergoing hydrolysis and thus being converted to carboxyl groups.

2. The fluoropolymer liquid composition according to Claim 1,

35 wherein said acid/acid salt groups, said acid/acid

salt groups precursors, and said organic groups capable of undergoing hydrolysis and thus being converted to carboxyl groups are each bound to a fluoroether side chain represented by the general formula (I):

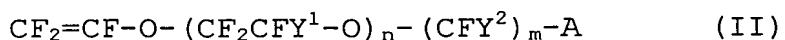


wherein Y^1 represents a fluorine or chlorine atom or a perfluoroalkyl group, n represents an integer of 0 to 3, the n atoms/groups of Y^1 may be the same or different, Y^2 represents a fluorine or chlorine atom, m represents an integer of 1 to 5, and the m atoms of Y^2 may be the same or different; and

wherein said fluoroether side chain is bound, via ether bonding, to a carbon atom constituting a perfluoroethylene unit in the main chain of the crosslinkable fluoropolymer.

3. The fluoropolymer liquid composition according to Claim 1 or 2,

wherein said crosslinkable fluoropolymer is a fluoropolymer precursor obtained by polymerizing a fluorovinyl ether derivative represented by the general formula (II):



wherein Y^1 represents a fluorine or chlorine atom or a perfluoroalkyl group, n represents an integer of 0 to 3, the n atoms/groups of Y^1 may be the same or different, Y^2 represents a fluorine or chlorine atom, m represents an integer of 1 to 5, the m atoms of Y^2 may be the same or different, and A represents $-SO_2X$, $-COOM^3_{1/L}$ or an organic group capable of undergoing hydrolysis and thus being converted to a carboxyl group; X represents a halogen atom, $-OM^4_{1/L}$, $-NR^{13}R^{14}$ or $-ONR^{15}R^{16}R^{17}R^{18}$, wherein R^{13} and R^{14} are the same or different and each represents a hydrogen atom, an alkali metal, an alkyl group or a sulfonyl-containing group, M^3 and M^4 each represents a metal having a valence of L ,

and R^{15} , R^{16} , R^{17} and R^{18} are the same or different and each represents a hydrogen atom or an alkyl group containing 1 to 4 carbon atoms,

or one derived from said fluoropolymer precursor.

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4. The fluoropolymer liquid composition according to Claim 3,

wherein said fluoropolymer precursor is an at least binary copolymer obtained by polymerization of said
10 fluorovinyl ether derivative and a fluoroethylenic monomer.

5. The fluoropolymer liquid composition according to Claim 3 or 4,

wherein Y^1 is a trifluoromethyl group, Y^2 is a
15 fluorine atom, n is 0 or 1, and m is 2.

6. The fluoropolymer liquid composition according to any one of Claims 1 to 5,

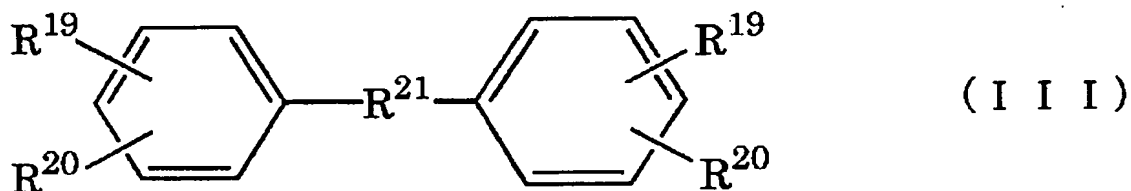
wherein the organic groups capable of undergoing
20 hydrolysis and thus being converted to carboxyl groups are $-\text{COOR}^{12}$, in which R^{12} represents an alkyl group, or $-\text{CONR}^{24}\text{R}^{25}$, in which R^{24} and R^{25} are the same or different and each represents an alkyl group or a hydrogen atom.

25 7. The fluoropolymer liquid composition according to any one of Claims 1 to 6,

wherein the crosslinkable functional group is a cyano group or a crosslinkable carboxyl group and

wherein said fluoropolymer liquid composition
30 comprises the fluoropolymer liquid (A) and, further, a crosslinking agent (B),

said crosslinking agent (B) being a crosslinking agent (B1) represented by the general formula (III):



wherein one of R^{19} and R^{20} represents $-NH_2$ and the other represents $-NH_2$, $-NH-Ph$, $-OH$ or $-SH$, Ph represents phenyl group and R^{21} represents $-SO_2-$, $-O-$, $-CO-$, an alkylene group
 5 containing 1 to 6 carbon atoms, a perfluoroalkylene group containing 1 to 10 carbon atoms or a single bond.

8. The fluoropolymer liquid composition according to Claim 7,

10 wherein R^{19} and R^{20} each is $-NH_2$ or one of them is $-NH_2$ and the other is $-NH-Ph$.

9. The fluoropolymer liquid composition according to any one of Claims 1 to 6,

15 wherein the crosslinkable functional group is $-I$ or $-Br$,

wherein said fluoropolymer liquid composition comprises the fluoropolymer liquid (A) and, further, a crosslinking agent (B),

20 said crosslinking agent (B) being a polyfunctional unsaturated compound.

10. The fluoropolymer liquid composition according to Claim 9,

25 wherein the polyfunctional unsaturated compound is triallyl isocyanurate.

11. The fluoropolymer liquid composition according to any one of Claims 1 to 10,

30 said fluoropolymer liquid composition comprising the

fluoropolymer liquid (A) and, further, at least one alcohol (C) selected from the group consisting of methanol, ethanol, propanol and tetrafluoropropanol.

5 12. The fluoropolymer liquid composition according to any one of Claims 1 to 11,

said fluoropolymer liquid composition comprising the fluoropolymer liquid (A) and, further, a film-forming auxiliary agent (D),

10 said film-forming auxiliary agent (D) being an organic liquid miscible with water and having a boiling point exceeding 100°C but not exceeding 300°C.

15 13. The fluoropolymer liquid composition according to Claim 12,

wherein the acid/acid salt groups precursors each is $-\text{SO}_2\text{NR}^{22}\text{R}^{23}$ or a group capable of undergoing hydrolysis and thus being converted to a carboxyl group, R^{22} and R^{23} being as defined above and

20 wherein the film-forming auxiliary agent (D) is (1) a phosphate ester, (2) an ethylene oxide oligomer monohydroxy ether and/or a cyclic amide or a cyclic amide derivative.

25 14. The fluoropolymer liquid composition according to any one of Claims 1 to 13, said fluoropolymer liquid composition comprising the fluoropolymer liquid (A) and, further, an active substance (E).

30 15. The fluoropolymer liquid composition according to any one of Claims 1 to 14,

wherein said crosslinkable fluoropolymer contains sulfonic acid groups or carboxyl groups, or salt forms of sulfonic acid groups or carboxyl groups, said crosslinkable fluoropolymer is obtained by hydrolysis, in the presence of
35 water, of groups of the formula $-\text{SO}_2\text{X}^1$ or $-\text{COZ}^1$ contained in

the fluoropolymer precursor, X^1 representing a halogen atom and Z^1 representing an alkoxyl group,.

16. The fluoropolymer liquid composition according
5 to any one of Claims 1 to 15,

wherein the fluoropolymer liquid (A) is a
fluoropolymer liquid dispersion (AD) and

wherein the solid matter concentration of said
fluoropolymer liquid dispersion (AD) is 2 to 80% by mass.

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17. The fluoropolymer liquid composition according
to Claim 16,

the fluoropolymer liquid dispersion (AD) being an
fluoropolymer aqueous dispersion (ADA) in which the liquid
15 dispersion medium is an aqueous dispersion medium,

said aqueous dispersion medium having a water content
of 10 to 100% by mass.

18. The fluoropolymer liquid composition according
20 to any one of Claims 1 to 15,

wherein the fluoropolymer liquid (A) is a
fluoropolymer solution (AS) and

wherein the crosslinkable fluoropolymer (PS) amounts
to 0.1 to 10% by mass of said fluoropolymer liquid
25 composition.

19. A method of producing a fluorine-containing
cured article,

in which the fluoropolymer liquid composition
30 according to any one of Claims 1 to 18 is applied to a
substrate or a porous material is immersed in said
composition, the liquid medium is then removed and a
crosslinking treatment is carried out to produce said
fluorine-containing cured article.

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20. A method of producing a fluorine-containing cured article,

in which the fluoropolymer liquid composition according to Claim 9 or 10 is applied to a substrate or a porous material is immersed in said composition, the liquid medium is then removed and a crosslinking treatment is carried out using a peroxide compound as a crosslinking reaction initiator to produce said fluorine-containing cured article.

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21. The method of producing a fluorine-containing cured article according to Claim 19 or 20,

wherein the crosslinking treatment is a crosslinking treatment using high energy.

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22. The method of producing a fluorine-containing cured article according to Claim 21,

wherein the crosslinking treatment using high energy is carried out by heating, exposure to radiation, electron beam irradiation or photoirradiation.

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23. The method of producing a fluorine-containing cured article according to any one of Claims 19 to 22,

wherein said fluorine-containing cured article comprises an immobilized active substance cured article containing an active substance (E).

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24. The method of producing a fluorine-containing cured article according to Claim 23,

wherein the active substance (E) is a catalyst.

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25. The method of producing a fluorine-containing cured article according to Claim 24,

wherein the catalyst is a platinum-containing metal.

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26. The method of producing a fluorine-containing cured article according to any one of Claims 23 to 25, wherein the immobilized active substance cured article is an electrode body for a solid polymer electrolyte fuel cell.

27. The method of producing a fluorine-containing cured article according to any one of Claims 19 to 22, wherein said fluorine-containing cured article is an electrolyte membrane.

28. The method of producing a fluorine-containing cured article according to any one of Claims 23 to 25, wherein said fluorine-containing cured article is a membrane electrode assembly (MEA) which is the electrode body for a solid polymer electrolyte fuel cell joining together with the electrolyte membrane.